CLAIMS

What is claimed is:

1. ~~A method for managing power in a handheld computer, the handheld computer~~ having a sleep mode setting and comprising a battery, at least one input device for turning the handheld computer on, and at least one device for detecting a battery power level, the method comprising:

   receiving an input signal to turn the handheld computer on;

   determining whether the handheld computer is in the sleep mode;

   accessing the device for detecting the battery power level if the handheld computer is in the sleep mode;

   responsive to detecting the battery power level, comparing the detected battery power level to a first predetermined power level; and

   maintaining the handheld computer in the sleep mode if the detected battery power level is less than the first predetermined power level.

2. The method of claim 1, wherein accessing the device for detecting the battery power ~~level is carried out by an analog-to-digital converter device.~~

3. ~~The method of claim 1, wherein comparing the detected battery power level to a first~~ predetermined power level includes a first predetermined power level which occurs on or about one week prior to the handheld computer losing data stored in a memory of the handheld computer.

4. The method of claim 1, wherein comparing the detected battery power level to a first predetermined power level includes a first predetermined power level which is determined based on measuring an ambient temperature of the handheld computer.

24

1   5.   ~~The method of claim 1, wherein comparing the detected battery~~ power level to a first

2   predetermined power level includes a first predetermined power level which is on or

3   ~~about 3.71 volts.~~

1   6.   ~~The method of~~ claim 1, wherein maintaining the sleep mode comprises:

2   receiving an input signal for turning on power in the handheld computer;

3   responding to the input signal by determining whether the handheld computer is in a

4   sleep mode; and

5   responsive to determining that the handheld computer is in a sleep mode, masking

6   interrupt signals for powering one or more applications and devices of the

7   handheld computer.

1   7.   The method of claim 6, wherein;

2   masking interrupt signals for powering the one or more applications and devices of

3   the handheld computer includes masking interrupt signals for powering one or

4   more applications and devices which provide a feedback to the user that the

5   handheld computer is operational.

1   8.   The method of claim 7, wherein masking interrupt signals for powering the one or

2   more applications and devices which provide a feedback to the user that the handheld

3   computer is operational includes masking interrupt signals for powering a display

4   device.

1   9.   The method of claim 7, wherein masking interrupt signals for powering the one or

2   more applications and devices which provide a feedback to the user that the handheld

3   computer is operational includes masking interrupt signals for powering a

4   communications device.

1   10.   A method of managing power in a handheld computer, the handheld computer having

2   a sleep mode setting and comprising a device for detecting a battery power level, the

3   method comprising:

4   monitoring the battery power level at predetermined periodic intervals;

5   responsive to each battery power level detection, comparing the detected battery

6   power level to a first predetermined power level; and

7   responsive to determining that the detected battery power level is less than the first

8   predetermined power level, setting the sleep mode in the handheld computer.

1   11.   The method of claim 10, wherein the step of monitoring the battery power level is

2   carried out by an analog-to-digital converter device.

1   12.   The method of claim 10, wherein setting the sleep mode in the handheld computer

2   further includes:

3   providing a transient warning message to an user indicating the sleep mode is being

4   set.

1   13.   The method of claim 12, wherein providing the warning message includes at least one

2   of:

3   providing an audible message in the form of an alarm;

4   providing an audible message in the form of a synthesized voice message;

5   providing a visible message on a display device; and

6   providing a visible message in the form of a flashing signal light.

1   14.   The method of claim 10, wherein setting the sleep mode in the handheld computer

2   comprises:

3   switching the handheld computer to a low energy-consuming shutdown state; and

4   masking interrupt signals for powering one or more applications and devices of the

5   handheld computer.

1   15.   The method of claim 14, wherein:

2   masking interrupt signals for powering the one or more applications and devices of

3   the handheld computer includes masking interrupt signals for powering one or

4   more applications and devices which provide a feedback to the user that the

5   handheld computer is operational.

1   16.   The method of claim 15, wherein:

2   masking interrupt signals for powering the one or more applications and devices

3   which provide a feedback to the user that the handheld computer is operational

4   includes masking interrupt signals for powering a display device.

1   17.   The method of claim 15, wherein:

2   masking interrupt signals for powering the one or more applications and devices

3   which provide a feedback to the user that the handheld computer is operational

4   includes masking interrupt signals for powering a communications device.

1   18.   A method for managing power in a handheld computer having a sleep mode setting,

2   the handheld computer comprising a battery, at least one input device for turning the

3   handheld computer on, and at least one device for detecting a battery power level, the

4   method comprising:

5   replenishing the primary energy source;

6   receiving an input signal to turn the handheld computer on;

7   determining whether the handheld computer is in the sleep mode;

8   accessing the device for detecting the battery power level if the handheld computer is

9   in the sleep mode;

10   ~~responsive to detecting the battery power level,~~ comparing the detected battery power

11   level to a first predetermined power level;

12   comparing the detected battery power level to a second predetermined power level if

13   the detected battery power level is greater than the first predetermined power

14   level; and

15   exiting the sleep mode when the detected battery power level is greater than the

16   second predetermined power level.

1   19.   The method of claim 18, wherein the battery of the handheld computer is a

2   rechargeable battery, replenishing the primary energy source comprising:

3   recharging the rechargeable battery.

1   20.   The method of claim 18, wherein the battery of the handheld computer is a non-

2   rechargeable battery, replenishing the primary energy source comprising:

3   replacing the non-rechargeable battery.

1   21.   The method of claim 18, wherein the exiting the sleep mode occurs when the detected

2   battery power level is greater than a second predetermined voltage of on or about 0.10

3   volts higher than the first predetermined voltage.

1   22.   The method of claim 18, wherein the exiting the sleep mode occurs when the detected

2   battery power level is greater than a second predetermined voltage of on or about 3.81

3   volts.

1   23.   An apparatus for reserving power in a handheld computer, the handheld computer

2   having a sleep mode setting, a battery as a primary energy source, at least one input

3   device for turning on power, and at least one device for detecting a battery power

4   level, the handheld computer including a subsystem, the subsystem coupled to the

5   device for detecting a battery power level, the apparatus comprising:

6   responsive to receiving an input signal to turn device power on, means for accessing

7   the sleep mode setting;

8   responsive to determining that the handheld computer is in the sleep mode, means for

9   accessing the device for detecting the battery power level; and

10   responsive to the detected battery power level, means for maintaining the sleep mode

11   or exiting the sleep mode.

1   24. The apparatus of claim 23, wherein:

2   the device for detecting the battery power level includes an analog-to-digital

3   converter.

1   25. The apparatus of claim 23, wherein the subsystem comprises:

2   a processor coupled to a interrupt controller and a memory controller, the interrupt

3   controller coupled to a memory, the memory including a sleep mode software and

4   a residual energy manager module.

1   26. The apparatus of claim 25, further comprising:

2   responsive to detecting a battery power level, means comparing the detected battery

3   power level to a first predetermined power level; and

4   responsive to determining the detected battery power level is less than the first

5   predetermined power level, means for maintaining the handheld computer in the

6   sleep mode.

1   27. The apparatus of claim 26, wherein the first predetermined power level is set at a level

2   which provides on or about 7 days of a normal usage of the handheld computer prior

3   to the handheld computer losing data stored in a memory of the handheld computer

1 28. The apparatus of claim 26, further comprising:

2   a thermal sensor; and

3   means for setting the first predetermined power level based on the thermal sensor

4   detecting an ambient temperature of the handheld computer.

1 29. The apparatus of claim 26, wherein the first predetermined power level is on or about

2   3.71 volts.

1 30. The apparatus of claim 26, further comprising:

2   responsive to receiving an input signal for turning on power in the handheld

3   computer, means for determining whether the handheld computer is in a sleep

4   mode; and

5   responsive to determining that the handheld computer is in a sleep mode, means for

6   operating the interrupt controller to mask interrupt signals for powering one or

7   more applications and devices of the handheld computer.

1 31. The apparatus of claim 30, wherein the one or more applications and devices of the

2   handheld computer includes an application or device which provides a feedback to the

3   user that the handheld computer is operational.

1 32. The apparatus of claim 31, wherein the one or more applications and devices of the

2   handheld computer includes a display device.

1 33. The apparatus of claim 31, wherein the one or more applications and devices of the

2   handheld computer includes a communications device.

1 34. An apparatus for reserving power in a handheld computer, the handheld computer

2   having a sleep mode setting, a battery as a primary energy source, at least one input

3   device for turning on power, and at least one device for detecting a battery power

4   level, the handheld computer including a subsystem, the subsystem coupled to the

5   device for detecting a battery power level, the apparatus comprising:

6   means for monitoring the battery power level at predetermined periodic intervals;

7   responsive to each battery power level detection, means for comparing the detected

8   battery power level to a first predetermined power level; and

9   responsive to determining that the detected battery power level is less than the first

10   predetermined power level, means for setting the sleep mode in the handheld

11   computer.

1   35.   The apparatus of claim 34, wherein the device for detecting the battery power level

2   includes an analog-to-digital converter.

1   36.   An apparatus for reserving power in a handheld computer, the handheld computer

2   having a sleep mode setting, a rechargeable battery as a primary energy source, at

3   least one input device for turning on power, and at least one device for detecting a

4   battery power level, the handheld computer including a subsystem, the subsystem

5   coupled to the device for detecting a battery power level, the apparatus comprising:

6   responsive to receiving an input signal to turn device power on, means for accessing

7   the sleep mode setting;

8   responsive to determining that the handheld computer is in the sleep mode, means for

9   accessing the device for detecting the battery power level; and

10   responsive to detecting a battery power level greater than the second predetermined

11   power level, means for exiting the sleep mode.

1   37.   The apparatus of claim 36, the battery of the handheld computer further comprising:

2 ~~a rechargeable battery which is recharged to a voltage~~ higher then the second

3   predetermined voltage prior to receiving the input signal to turn device power on.

1   38. The apparatus of claim 36, the battery of the handheld computer further comprising:

2   a non-rechargeable battery with a voltage higher then the second predetermined

3   voltage having replaced a discharged battery of the handheld computer prior to

4   receiving the input signal to turn device power on.

1   39. The apparatus of claim 36, wherein the second predetermined voltage is on or about

2   0.10 volts higher than the first predetermined voltage.

1   40. The apparatus of claim 36, wherein the second predetermined voltage is on or about

2   3.81 volts.

1   41. A handheld computer having a sleep mode setting, comprising:

2   a processor;

3   a memory device;

4   a battery;

5   an input device to signal to the processor to power the handheld computer on;

6   a detector for detecting a battery power level; and

7   software program residing in the memory device and executed by the processor, the

8   software having instructions for selecting an operation of the sleep mode in the

9   handheld computer when a detected battery power level is lower than a first

10   ~~predetermined power level.~~